Patent

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Drewes et al.

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For: METHODS AND DEVICES FOR MASS TRANSPORT ASSISTED OPTICAL ASSAYS

Group Art Unit: Not Yet Assigned

Examiner: Not Yet Assigned

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

In conjunction with the divisional patent application filed herewith, please enter the following amendments and consider the following remarks.

IN THE CLAIMS

Please cancel all of the currently pending claims, and enter the following new claims:

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Claim 51. A support comprising a surface on which an assay for an analyte of interest can be performed, comprising:

an attachment layer comprising diamond-like carbon on the support surface, wherein the attachment layer captures the analyte of interest for detection in the assay by binding the analyte directly to the diamond-like carbon.

Claim 52. A support according to claim 51, wherein the attachment layer comprises a layer of diamond-like carbon of between about 50 Å to about 3000 Å in thickness.

Claim 53. A support according to claim 51, wherein the degree of hydrophobicity of the attachment layer is determined by varying the sp^2 and sp^3 character of the diamond-like carbon.

Claim 54. A support according to claim 51, wherein the diamond-like carbon is configured to function as an antireflective layer.

Claim 55. A support according to claim 51, wherein the support further comprises an optically functional layer interposed between the support surface and the attachment layer.

Claim 56. A support according to claim 51, wherein the support provides a change in optical thickness upon binding of the analyte capable of attenuating one or more wavelengths of light.

Claim 57. A support according to claim 51, wherein the support is configured to provide laminar flow through or across the support.

Claim 58. A support according to claim 51, wherein the attachment layer comprises diamond-like carbon in a form selected from the group consisting of synthetic diamond, natural diamond, industrial diamond, monocrystalline diamond, resin-type diamond, polycrystalline diamond, amorphous carbon with diamond-like hardness and surface energy properties, amorphous hydrogenated diamond-like carbon, and non-crystalline to crystalline carbon films with diamond-like hardness and surface energy properties.

Claim 59. A support according to claim 51, wherein the diamond-like carbon comprises non-carbon material.

Claim 60. A support according to claim 59, wherein the non-carbon material is selected from the group consisting of hydrogen, silicon, and nitrogen.

Claim 61. A support according to claim 51, wherein the support comprises a material that is not compatible with high temperatures.

Claim 62. A support according to claim 61, wherein said high temperature is greater than 100°C.

Claim 63. A support according to claim 61, wherein the material that is not compatible with high temperatures is selected from the group consisting of cellulose acetate, PETE, polyester, polycarbonate, nylon, filter paper, polysulfones, polypropylene, and polyurethane.

Claim 64. A support according to claim 61, wherein the diamond like carbon has a hardness of about 15 to about 50 Gpa.

Claim 65. A support according to claim 61, wherein the attachment layer has a refractive index of about 1.5 to about 2.2.

Claim 66. A support according to claim 51, wherein said support is a biosensor.

Claim 67. A support comprising a surface on which an assay for an analyte of interest can be performed, comprising:

an attachment layer comprising a layer of diamond-like carbon of between about 50 Å to about 500 Å in thickness on the support surface, wherein said attachment layer specifically captures said analyte by binding said analyte to a capture molecule bound to the diamond-like carbon.

Claim 68. A support according to claim 67, wherein said capture molecule is selected from the group consisting of an antigen, an antibody, a receptor, a nucleic acid, an RNA,

a DNA, a polysaccharide, a lipopolysaccharide, an enzyme, a protein, a microorganism, a hapten, a drug, a ligand, and a chelator.

Claim 69. A support according to claim 67, wherein the degree of hydrophobicity of the attachment layer is determined by varying the sp^2 and sp^3 character of the diamond-like carbon.

Claim 70. A support according to claim 67, wherein said diamond-like carbon is configured to function as an antireflective layer.

Claim 71. A support according to claim 67, wherein said support further comprises an optically functional layer interposed between said surface and said attachment layer.

Claim 72. A support according to claim 67, wherein said support provides a change in optical thickness upon binding of said analyte capable of attenuating one or more wavelengths of light.

Claim 73. A support according to claim 67, wherein said support is configured to provide laminar flow through or across said support.

Claim 74. A support according to claim 67, wherein said attachment layer comprises diamond-like carbon in a form selected from the group consisting of synthetic diamond, natural diamond, industrial diamond, monocrystalline diamond, resin-type diamond, polycrystalline diamond, amorphous carbon with diamond-like hardness and surface energy properties, amorphous hydrogenated diamond-like carbon, and non-crystalline to crystalline carbon films with diamond-like hardness and surface energy properties.

Claim 75. A support according to claim 67, wherein the diamond-like carbon comprises non-carbon material.

Claim 76. A support according to claim 75, wherein the non-carbon material is selected from the group consisting of hydrogen, silicon, and nitrogen.

Claim 77. A support according to claim 67, wherein the support comprises a material that is not compatible with high temperatures.

Claim 78. A support according to claim 77, wherein said high temperature is greater than 100°C.

Claim 79. A support according to claim 77, wherein the material that is not compatible with high temperatures is selected from the group consisting of cellulose acetate, PETE, polyester, polycarbonate, nylon, filter paper, polysulfones, polypropylene, and polyurethane.

Claim 80. A support according to claim 77, wherein the diamond like carbon has a hardness of about 15 to about 50 Gpa.

Claim 81. A support according to claim 77, wherein the attachment layer has a refractive index of about 1.5 to about 2.2.

Claim 82. A support according to claim 67, wherein said support is a biosensor.

Claim 83. A method of assaying for the presence or amount of an analyte of interest in a sample, comprising:

contacting a support according to claim 51 with the sample, whereby analyte in the sample binds directly to the diamond like carbon;

contacting the bound analyte with a reagent that specifically binds to the bound analyte; and

detecting the bound analyte by measuring a mass change on the support surface.

Claim 84. A method according to claim 83, wherein mass change is detected by measuring an optical property of the support.

Claim 85. A method according to claim 84, wherein the optical property is selected from the group consisting of a change in reflectivity, a change in transmittance, a change in absorbance, extinction of a specific wavelength of light, enhancement of a specific wavelength of light, and a change in polarization of incident light.

Claim 86. A method according to claim 84, wherein the reagent that specifically binds to the bound analyte comprises a signal generating element or a mass enhancing element.

Claim 87. A method of assaying for the presence or amount of an analyte of interest in a sample, comprising:

contacting a support according to claim 67 with the sample, whereby analyte in the sample binds to the capture molecule bound to the diamond like carbon; and

detecting the bound analyte by measuring a mass change on the support surface.

Claim 88. A method according to claim 87, wherein mass change is detected by measuring an optical property of the support.

Claim 89. A method according to claim 88, wherein the optical property is selected from the group consisting of a change in reflectivity, a change in transmittance, a change in absorbance, extinction of a specific wavelength of light, enhancement of a specific wavelength of light, and a change in polarization of incident light.

Claim 90. A method according to claim 87, wherein the assay further comprises contacting the bound analyte with a reagent that specifically binds to the bound analyte.

Claim 91. A method according to claim 90, wherein the reagent that specifically binds to the bound analyte comprises a signal generating element or a mass enhancing element.

REMARKS

SUMMARY

The instant invention relates in part to supports on which an assay for one or more analytes can be performed. In particular, the invention discloses supports that are configured to capture analytes on a surface for detection, preferably using optical methods. In certain embodiments, a layer of diamond-like carbon can be used to directly or indirectly bind an antigen of interest.

Applicants have cancelled all of the claims filed with the application, and enter new claims 51-91. The new claims are fully supported by the specification as filed. For example, the specification describes a support comprising a diamond-like carbon attachment layer on page 18, lines 26-29, and page 42, lines 17-29; specific and non-specific binding on an attachment layer on page 11, lines 7-20; various capture molecules on page 35, lines 21-26, and originally filed claim 43; selecting diamond-like carbon having a specific degree of hydrophobicity on page 40, lines 6-20; configuring diamond-like carbon to function as an antireflective layer on page 43, lines 3-19; interposing an optically functional layer between a surface and an attachment layer on page 19, lines 1-6; a support providing a change in optical thickness upon analyte binding on page 20, lines 10-27; a support configured to provide laminar flow on page 27, lines 10-20; various forms of diamond-like carbon on page 19, line 26, through page 20, line 5; a support configured as a biosensor on page 42, line 27, through page 43, line 2; and diamond-like carbon comprising non-carbon materials on page 38, line 18, through page 39, line 2.

CONCLUSION

Applicants respectfully submit that the pending claims are in condition for allowance. An early notice to that effect is earnestly solicited. Should any matters remain outstanding, the Examiner is encouraged to contact the undersigned at the address and telephone number listed below so that they may be resolved without the need for additional action and response thereto.

Respectfully submitted,
Brobeck, Phleger & Harrison LLP

Dated: 9/28/00

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